WE CLAIM:

1. A method of fabricating a magnetic memory cell, comprising:

providing a substrate on which the magnetic memory cell is formed;

depositing a first ferromagnetic layer;

depositing a dielectric layer over the first ferromagnetic layer; and

depositing a second ferromagnetic layer over the dielectric layer, wherein at lease one of the layers is formed by atomic layer deposition (ALD).

2. The method of Claim 1, wherein the magnetic memory cell comprises a magnetic tunneling junction (MTJ).

3. The method of Claim 1, wherein the magnetic memory cell is a magnetic random access memory cell.

4. The method of Claim 1, wherein the dielectric layer is deposited by ALD.

5. The method of Claim 1, wherein the dielectric layer comprises aluminum oxide.

6. The method of Claim 1, wherein the first ferromagnetic layer is deposited by ALD.

7. The method of Claim 6, wherein depositing the first ferromagnetic layer by ALD comprises depositing a metal oxide by ALD and subsequently reducing the metal oxide to elemental metal.

8. The method of Claim 7, wherein the elemental metal comprises cobalt.

9. The method of Claim 1, wherein depositing the second ferromagnetic layer comprises an ALD process.

10. The method of Claim 9, wherein depositing the second ferromagnetic layer comprises depositing a metal oxide by ALD and subsequently reducing the metal oxide to elemental metal.

11. The method of Claim 10, wherein the elemental metal comprises cobalt.

12. The method of Claim 1, wherein the first ferromagnetic layer has a lower magnetic permeability than the second ferromagnetic layer.

13. The method of Claim 1, wherein the first ferromagnetic layer is thinner than the second ferromagnetic layer.

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14. A method of fabricating a magnetic memory cell, comprising:

providing a substrate on which the magnetic memory cell is formed;

depositing a first magnetic layer on the substrate;

forming a dielectric layer over the first magnetic layer;

depositing a magnetic metal oxide layer over the dielectric layer by atomic layer deposition (ALD); and

reducing the magnetic metal oxide layer to a magnetic elemental metal layer.

15. A method of fabricating a magnetic memory cell, comprising:

providing a substrate on which the magnetic memory cell is formed;

forming a first magnetic layer on the substrate;

depositing a first non-magnetic metal oxide layer over the first magnetic layer;

converting the first non-magnetic metal oxide layer to a first non-magnetic metal layer;

depositing an insulating layer on the first non-magnetic metal layer;

depositing a second non-magnetic metal oxide layer by atomic layer deposition (ALD);

converting the second non-magnetic metal oxide layer to a second non-magnetic metal layer; and

depositing a second magnetic layer on the second non-magnetic metal layer.

16. The method of Claim 15, wherein the first non-magnetic metal oxide layer is deposited by ALD.

17. The method of Claim 15, wherein the first non-magnetic metal oxide layer and the second non-magnetic metal oxide layer are converted to the first and second non-magnetic metal layers by reducing the metal oxide to elemental metal.

18. The method of Claim 17, wherein reducing comprises exposing the metal oxide layer to a chemical selected from the group consisting of hydrogen, hydrogen-rich radicals, carbon monoxide, alcohol vapor, aldehyde vapor and carboxylic acid vapor.

19. The method of Claim 15, wherein the first and the second non-magnetic metal oxide layers comprise copper oxide.

20. A method of fabricating a magnetic nanolaminate structure, comprising:

depositing a plurality of metal oxide layers on a substrate by atomic layer deposition (ALD); and

converting at least one of the metal oxide layers to elemental metal layers, wherein at least one of the metal oxide layers is magnetic.

21. The method of Claim 20, wherein the magnetic nanolaminate structure is part of a magnetic memory device.

22. The method of Claim 20, wherein the magnetic nanolaminate structure is part of a read-head.

23. The method of Claim 20, wherein the magnetic nanolaminate structure comprises a magnetic tunneling junction.

24. The method of Claim 20, wherein the magnetic nanolaminate structure is part of a spin valve transistor.

25. The method of Claim 20, wherein depositing the plurality of metal oxide layers comprises, in order: depositing a first magnetic metal oxide layer, depositing an insulating layer, and depositing a second magnetic metal oxide layer.

26. The method of Claim 20, wherein depositing the plurality of metal oxide layers comprises, in order: depositing a first magnetic metal oxide layer, depositing a first non-magnetic metal oxide layer, depositing an insulating layer, depositing a second non-magnetic metal oxide layer, and depositing a second magnetic metal oxide layer.

27. The method of Claim 20, wherein converting comprises reducing a metal oxide layer to elemental metal.

28. The method of Claim 27, wherein reducing comprises contacting the layer with a compound selected from the group consisting of hydrogen, hydrogen-rich radicals, carbon monoxide, alcohol vapor, aldehyde vapor and carboxylic acid vapor.

29. The method of Claim 20, wherein at least one of the metal oxide layers comprises a ferromagnetic oxide selected from the group consisting of magnetite (Fe_3O_4), CrO_2, manganite perovskites doped with alkaline earth metals and metal oxide superlattices.

30. The method of Claim 20, wherein the magnetic nanolaminate comprises at least one magnetic metal selected from the group consisting of iron (Fe), cobalt (Co) and nickel (Ni).

31. The method of Claim 20, wherein the magnetic nanolaminate comprises at least one non-magnetic metal.

32. The method of Claim 31, wherein the non-magnetic metal is copper.

33. A method of depositing a metal layer for a magnetic device by atomic layer deposition (ALD), wherein the ALD process comprises alternately contacting a substrate with volatile metal source chemicals and hydrogen-rich plasma.

34. The method of Claim 33, wherein the ALD process forms a metal oxide.

35. The method of Claim 34, further comprising reducing the metal oxide.

36. The method of Claim 34, wherein the metal oxide comprises a magnetic metal.

37. The method of Claim 36, wherein the magnetic metal is selected from the group consisting of iron (Fe), cobalt (Co) and nickel (Ni).

38. The method of Claim 34, wherein the metal oxide comprises a non-magnetic metal.

39. The method of Claim 33, wherein the magnetic device comprises an integrated MRAM magnetic tunnel junction.

40. The method of Claim 33, wherein the magnetic device comprises a spin valve transistor.

41. The method of Claim 33, wherein, the magnetic device comprises a pseudo spin valve.

42. A method of manufacturing a magnetic element in an integrated circuit, comprising:

providing a substrate comprising a hard magnetic material;

cleaning the substrate surface;

depositing an aluminum oxide tunneling dielectric by atomic layer deposition (ALD) on the substrate;

depositing cobalt oxide over the aluminum oxide by ALD; and

reducing the cobalt oxide to cobalt metal.

43. The method of Claim 42, wherein cleaning comprises sputter-etching.

44. The method of Claim 42, wherein cleaning comprises contacting the substrate surface with a gas selected from the group consisting of hydrogen, hydrogen-rich radicals, carbon monoxide, alcohol vapor, aldehyde vapor and carboxylic acid vapor.

45. The method of Claim 42, wherein reducing the cobalt oxide comprises contacting the substrate with a gas selected from the group consisting of hydrogen, hydrogen-rich radicals, carbon monoxide, alcohol vapor, aldehyde vapor and carboxylic acid vapor.

A method of reducing oxidized ferromagnetic metal in a magnetic structure into elemental metal comprising contacting the oxidized metal with a volatile organic compound selected from the group consisting of alcohols, aldehydes and carboxylic acids.

46. A method of fabricating a sensing element of a read-head comprising:

providing a substrate on which the sensing element is to be formed;

depositing a first ferromagnetic layer by atomic layer deposition (ALD);

depositing a conductive layer over the first ferromagnetic layer; and

depositing a second ferromagnetic layer over the conductive layer.

47. The method of Claim 46, wherein the conductive layer is deposited by atomic layer deposition.

48. The method of Claim 46, wherein the second ferromagnetic layer is deposited by atomic layer deposition.

49. The method of Claim 46, wherein the first ferromagnetic layer comprises NiFe and the second ferromagnetic layer comprises Co.

50. The method of Claim 46, wherein the conductive layer comprises Cu.

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